

THE GENUS ASPIDISCA EHRENBERG

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The following systematic account of the genus *Aspidisca* was undertaken with the idea that at some future time the writer would use one of the species for a series of culture experiments. In order to do this intelligently an extensive study of the literature of the genus was suggested by Prof. G. N. Calkins. This study had disclosed one or two rather obvious mistakes in the recent literature, and showed the need of a new systematic account of the genus. The confusion in a relatively simple and homogeneous group like the *Aspidiscas* indicates that considerable work still remains to be done in systematizing the whole group of Hypotrichs.

ASPIDISCA EHRENBERG 1830

O. F. Muller 1773, 1780, 1786, 1788. Bory 1824. Ehrenberg 1830, 1831, 1833, 1838. Dujardin 1841. Perty 1852. Claparede at Lachmann 1857. Stein 1859. Fresenius 1865. Diesing 1865-6. Quennerstedt 1867-8. Fromental 1874. Mereskovsky 1878. Kent 1881. Rees 1884. Fabre-Domergue 1885. Perejaslawzewa 1886. Gourret et Roesser 1886, 1888. Calkins 1902. Hamburger und Buddenbrock 1911.

The genus *Aspidisca* was originally separated off from O. F. Muller's *Trichoda* by Ehrenberg 1830 and placed in a separate family *Aspidiscina*. The family was given the following rather fanciful characterization: "animaux polygastriques à carapace, ayant un canal intestinal distinct à double orifice, dont seulement celui de l'anus est terminal." Under Bory de St. Vincent's name *Coccudina* Dujardin 1841 and afterward Perty described several species which are probably *Aspidiscas*, though the fact can be established only in the case of Dujardin's *Coccudina costata*. The principle character which distinguishes the genus *Coccudina* from his other *Ploesconien* was the absence of a mouth. This does not stand for as Claparede et Lachmann 1857 first showed the mouth is at the base of a peristomial field of cilia on the left side and between the upper and lower plates of the cuirass. These investigators dis-

tinguished *Aspidisca* from the other genera in their family Oxytrichina by the absence of frontal cirri. Stein 1859 again made of the genus a separate family under Ehrenberg's name and considered that it represented a connecting link between his family Chlamydodonta (*Chilodon*, *Ergvilia* etc.) and the Euplotina. Kent 1881 recognized that the main point of difference between this genus and the remainder of his family Euplotidae was "in the more rearward location of the peristome field and consequent non-projection of the adoral fringe of cilia beyond the lateral border," and included the genus in that family. This classification is generally accepted. The location of the peristome field as above described and the absence of marginal cirri are sufficient to distinguish the genus from the other genera of the family.

Description of the Genus *Aspidisca* Ehr. 1830.

Synonymy: *Trichoda* p p—Muller 1773, 1780, 1786, 1788.

Tribulina? *Ratulus?* p p—Bory 1824.

Oxytricha? p p *Euplotes* p p *Loxodes plicatus* ??—Ehrenberg 1838.

Coccudina p p—Dujardin 1841, and Perty 1852.

Onychaspis—Diesing 1856.

Monostylus ??—Perejaslawzewa.

Animalcules ovate, small, rigid, encuirassed, with a convex dorsal and a plain ventral surface; left side nearly straight, right sharply convex; the right border having a thickened margin; peristome limited to the left ventral side where it forms a small depression which may or may not just reach—but in no case extends beyond—the anterior border; associated with it is a simple fringe of adoral cilia which do not extend beyond the border; the ventral surface on the left side extends to a greater or less degree toward the right under the peristome, so that the latter is located in a pocket between the upper and lower surface; several large claw-like styles toward the anterior end and in the center of the ventral region; a variable number of posterior or anal styles arranged in a single row just inside the posterior ventral margin; anal aperture placed far back, debouching a little in advance of the anal styles. Cosmopolitan, fresh and salt water.

The number and position of the ventral and anal cirri has thus far been considered the important diagnostic character of the species of *Aspidisca*. Yet *A. polystyla* Stein was described as having from ten to twelve anal cirri, and a variety described by Calkins 1902 from Woods Hole has thirteen anal and eight rather than seven ventral cirri—which number had not previously been

exceeded in the genus. Calkin's variety of *A. hexeris* Quenn. has also eight ventral cirri, while *A. Andrewii* Meresch.=*A. hexeris* has the seven very differently arranged. Fresenius 1865 described *A. leptaspis* with five anal styles, but Rees 1884 showed that one of these often frays out into three, making seven in all. Fabre-Domergue 1885 described this seven styled form as a new species *A. crenata*. It appears then that the number and position of the cirri is to a large degree variable, and that they must be discarded as of importance in differentiating species. A re-examination of the genus discloses that the species can be readily distinguished by the character of the stiff cuirass. This may be smooth or serrated dorsally, and the left border may be plain or incised so as to produce a varying number of posteriorly directed spurs. The form of the stiff cuirass is apparently extremely constant within the genus, and a few minutes observation of it will generally suffice to identify the species. In view of this fact it appears that *A. lynceus* and *A. polystyla* are really very similar, and further work may disclose that they are one and the same species. The latter of these species was placed in a separate subgenus—*Onychaspis*—by Stein and a separate genus by Diesing on the basis of its larger number of styles, yet one might easily be derived from the other by the continuation of the fraying out process which has been noted above in *A. leptaspis*. From the simple smooth bordered forms like *A. lynceus* it is possible that the spurred and serrated forms have been derived. On the basis of the form of the cuirass a simple key for the quick identification of the species of *Aspidisca* may be constructed.

KEY FOR THE IDENTIFICATION OF THE SPECIES OF ASPIDISCA

- A. Right and left border smooth.....a
- B. Left border incised to form a single backwardly directed spur in the posterior third.....A. *hexeris*
- C. Left border with two spurs, one in the anterior and one in the posterior third.....c
- D. Left border with three spurs.....A. *sedigita*
- a. Dorsal surface with recurved thorn-like appendage...*A. *turrita*
 Dorsal surface without thorn.....a'
- c. Dorsal surface and posterior border serrated.....A. *leptaspis*
 Dorsal surface smooth.....A. *lynceus*
 a'. Ventral plate projecting beyond left border of carapace*A. *costata*
 Ventral plate not projecting.....a"
 a". Peristome reaching anterior border, anal cirri 5.....A. *lynceus*
 Peristomial cilia not reaching anterior border, anal cirri more than 5.....A. *polystyla*
- A. Right and left border smooth.
- A. *lynceus* (Muller).

Trichoda lynceus Muller 1773, 1780, 1786, 1788.

Ratulus lynceus ? Bory 1824.

Aspidisca lynceus Ehrenberg 1838.

Coccludina crassa ? Dujardin 1841.

Aspidisca lynceus Claparede et Lachmann 1867 t6.

Body ovate, widest and somewhat truncate posteriorly; the marginal border of the carapace entirely even, the left one straight, the right one somewhat convex; the dorsal surface smooth, or marked longitudinally with three feeble furrows; the inferior surface bearing 7 ventral styles in two rows—anterior with 4, posterior with 3- 5 anal styles. L—1/540". Salt water.

Distribution: Baltic (Ostsee) at Hapsal (Eichwald), Warberg and Wisby (Quenn.), Wismar (Ehr. and Stein), Ostershelde (Rees), Mittelmeer Cette (Duj.), Gulf of Naples (Geta-Fentz), Gulf of Mexico (Smith), Siberia and Egypt (Schewiakoff).

*Indicates the only forms so far reported in the literature.

This species is the type of the genus as correctly designated by Claparede et Lachmann, and later by Fromental.

A. polystyla Stein.

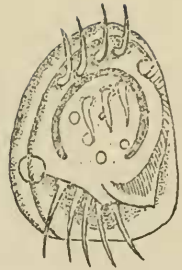
A. polystyla Stein 1859 (subgenus *Onychaspis*).

Onychaspis Diesing 1865.

A. polystyla var. *maxima* Gourret et Roeser 1886.

A. plana Perejas. 1886.

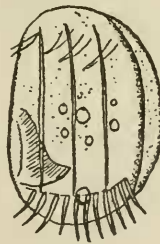
A. polystyla Calkins 1902.



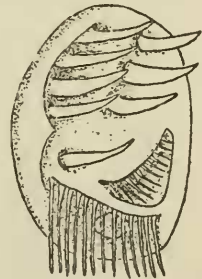
A. lynceus ventralside
Stein-Taf. III, Fig. 4

Body oval, the margin entire, the left border nearly straight; the dorsal surface slightly convex, traversed by three longitudinal furrows; ventral styles 7 to 8, forming two anterior, oblique, parallel rows of 3 or 4, and 3, one separate ventral style stationed by itself to the right and rear of the other six; anal styles variable 10-13. L—1/510". Sea water.

Distributions:—Warberg (Quenn), Bay of Concarneau (Fabre-Domergue) Harbor of Marseille and Bastia Corsica (Gour. et Roes.), Harbor of Trieste (Stein), Gulf of Naples (Geta-Entz), Black Sea (Perejas.), Woods Hole, U. S. A. (Calkins).



A. polystyla—ventral and dorsal side.
Stein-Taf. III—Figs. 18 and 19.



A. polystyla—ventral side
Calkins—Fig. 57.

This species is evidently close to the preceding in all except the number and distribution of the cirri. In these it is very variable. Calkin's variety from Woods Hole differs from Stein's original form in the possession of 8 ventral and 13 anal styles—the former banked and very massive. *A. plana* as described by Perejaslawzewa is identical in all essentials with this species. A form described by Gourret et Roeser 1886 as *A. polystyla* var. *maxima* has 7 anal styles. The drawing (Pl. XXXIV, Fig. 1), which is evidently from the dorsal rather than the ventral side as stated, is so

inaccurate that it is of little value. Except for the small number of anal cirri, the description is fairly close to that of Stein.

A. turrita (Ehr.)

Euplotes turritus Ehr. 1838.

Aspidisca turrita Clap. et Lach. 1857.

Body suborbicular, widest and somewhat truncate posteriorly, its marginal border even, the left side nearly straight, the opposite one rounded; a thorn-like recurved spine developed from the center of the dorsal surface; ventral and anal styles as in *A. lynceus*. L—1/450". Fresh and salt water.

Distributions: Baltic (Ostsee) at Hapsal (Eichwald), Wismar (Ehr.) Gulf of Naples (Geta-Entz), Gulf of Mexico (Smith), common in pond water about New York City.

A. costata (Duj.)

Trichoda cicada? Muller 1786, 1788.

Oxytricha cicada? Ehrenberg 1838.

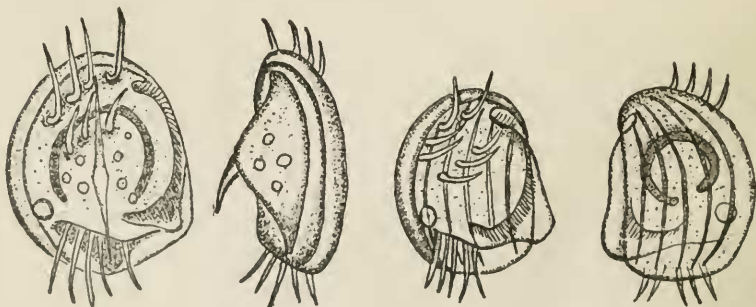
Coccudina constata Duj. 1841.

Aspidisca cicada Clap. et Lach. 1857.

Aspidisca costata Stein 1859.

Body nearly oval, or left side nearly straight, right convex; the ventral portion developed outwards and backwards beneath the peristome in the form of a triangular plate toward the posterior extremity of the left side; dorsal surface grooved by six longitudinal furrows; ventral styles 7, in two oblique rows—anterior 4, posterior 3; anal styles 5. L—1/690". Brackish or pond water.

Distribution:—North Sea Water Aquarium (Fresenius), Finland Brackwasserbuchten at Ransösund (Levander), Gulf of Genoa (Gruber), Gulf of Mexico (Smith), Buenos Aires (de la Rue), common in pond water in vicinity of New York City.



A. turrita—ventral and side view.
Stein-Taf. III—Figs. 11 and 14.

A. costata—ventral and dorsal view.
Stein-Taf. III—Figs. 15 and 16.

This is the only species recognizable from Dujardin's drawings. It is there drawn with seven anal cirri, and the ventral plate is not shown. In spite of these inaccuracies, however, we must agree with Stein that the form of the body and the grooved dorsal surface are unmistakable.

B. Left border armed with a single backwardly directed spur in its posterior third.

A. hexeris Quenn.

A. hexeris Quennerstedt 1867 v. 4.

A. Andrewii Mereshkowsky 1878.

A. hexeris Calkins 1902.

Body elliptical, about one and one-half times as long as broad, equally rounded at each extremity; the left border armed close behind its center with a single backwardly directed spurlike projection; dorsal surface usually grooved by three faint longitudinal furrows; ventral styles short and thick, 7 to 8 in number, generally in two rows of 3 and 3, with one placed by itself posteriorly, 6 anal styles. L—1/500". Salt water.

Distribution: Wisby, Gotland (Quenn), White Sea (Meresch), Woods Hole, U. S. A. (Calkins).

A. hexeris as described by Calkins from Woods Hole agrees closely with Quennerstedt's original description except for the possession of 8 ventral styles. As already indicated this character is not believed to be of importance in differentiating species. *A.*



A. hexeris—dorsal side.
Quenn. II—Fig. 19.



A. hexeris—ventral side.
Calkins—Fig. 50.

Andrewii Meresch. is in all respects identical with this species. Hamburger und von Buddenbrock 1911 consider this species to be identical with *A. leptaspis* Fresenius. The resemblance between the two is merely superficial, however, for the anterior spur and

the marked serration of the cuirass, both of which are extremely constant in *A. leptaspis*, are never found in *A. hexeris* either in the European or American varieties.

C. Left border armed with two spurs, one in the anterior and one in the posterior third.

A. lyncaster (Muller).

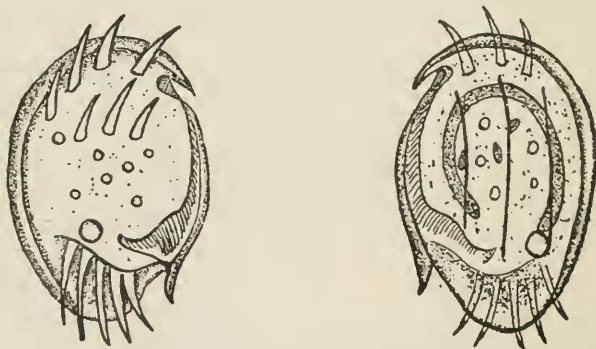
Kerona lyncaster? Muller 1786.

Trichoda lyncaster Muller 1788.

A. lyncaster Stein 1859.

Body ovate, rounded on the right side and at the two ends, the anterior border of the left side incised so as to produce a posteriorly directed spur-like projection, a similar aculeate spur, curved slightly outwards, projecting from the ventral surface of the carapace on the same side within a short distance of the posterior margin; ventral styles short and thick, 7 in number, placed in two oblique rows of 4 and 3; anal styles 5. L—1/450'—1/360". Salt water.

Distribution: Finland See at Löfo (Levander), Baltic Sea at Travemünde and Stralsund (Stein), Kiel Harbor (Möbius), Gulf of Genoa (Gruber), Gulf of Naples (Geta-Entz), Harbor of Bastia Corsica (Gour. et Roes.)



A. lyncaster—ventral and dorsal view.
Stein-Taf. III—Figs. 1 and 2.

A. leptaspis (Fresenius).

A. leptaspis Fresenius 1865.

A. crenata Fabre-Domergue 1885.

Body oval, blunt at either end, the left side somewhat less curved than the right; the right border smooth, the left incised in the anterior third so as to produce a feeble spurlike projection; in its posterior third a similar but more prominent and sickle shaped spur from both the upper and lower plates of the cuirass; outer posterior border of upper plate evenly notched or ser-

rated; lower plate similarly serrate anteriorly and posteriorly; upper surface may show three feeble longitudinal striations; ventral styles 7—two rows of 3 each, with one placed posteriorly by itself; anal styles 5 to 7. L—.065—.07 mm. Salt water.

Distribution: North Sea Water Aquarium (Fresenius), Osterschelde, Belgian coast (Rees), Bay of Concarneau (Fabre-Domergue).

This peculiar form is of especial interest because of the observation of van Rees 1884 with regard to the fraying out of one of the anal cirri so as to form three, making a total of seven instead of five as the species was originally described by Fresenius. The seven styled form was described by Fabre-Domergue 1885 as a new species *A. crenata*. The fact that such a condition occurs proves that the actual number of cirri is of little value in recognizing species, and suggests that a similar condition may exist in other Hypotrachs which have not been observed for an extended period. The anterior tuft of cilia figured by van Rees is also of interest. If the observation is correct it appears that the adoral cilia may sometimes extend a considerable distance towards the anterior end. On the other hand it seems more likely that the tuft represents an additional ventral cirrus—a condition observed by Calkins in at least two other species of *Aspidisca*.



A. leptaspis—ventral view.
van Rees—Fig. 11.



Ventral view
Fabre-Domergue—Fig. VII.

D. Left border with three spurlike projections.

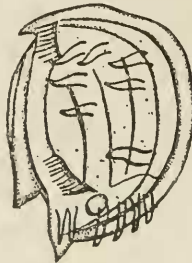
A. sedigita Quenn.

A. sedigita Quennerstedt 1868 v6.

Body broadly ovate, suborbicular, the right border smooth and rounded, the left one incised so as to produce an anterior, middle, and posterior spurlike projection—the middle spur extending from the ventral surface as does the posterior one in *A. lyncaster*; ventral styles 7, short and thick, centrally

disposed; six stout, scarcely prominent anal styles. L—1/325". Salt water.
Distribution: Wisby, Gotland (Quenn).

This species is made identical with *A. lyncaster* by Hamburger und von Buddenbrock 1911. According to Quennerstedt's original description, however, *A. sedigita* possesses a third spur at the posterior end of the body giving it a characteristic pointed appearance. This together with its smaller size makes it necessary that the species be retained.



A. sedigita—Dorsal side.
Quenn-Taf. II—Fig. 2.

DOUBTFUL SPECIES

A. denticulata Ehr. 1838 is insufficiently described and the figure is not recognizable as an *Aspidisca*. The name suggests that it may be identical with *A. leptaspis* Fres. but the description of the denticulations as on the left side precludes this.

A. radiata Fromentel and *A. pulvinata* Fromentel 1874 probably cannot be considered good species because of insufficient description. The former has ten ventral cirri and the adoral fringe of cilia at the anterior end, which probably put it outside the limits of the genus. The latter has no apparent differences from *A. costata* (Duj.).

A. bipartita Gourret et Roeser 1886 very clearly has none of the characters of the genus, such as a group of ventral styles and an adoral fringe of cilia on the left side of the ventral surface. The description and pictures look very much like a minute crustacean belonging to the group Cladocera.

Columbia University, New York City.
October 19th, 1916.

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